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# EUROPEAN PATENT APPLICATION

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(54) Constructional toy.

(57) A toy construction kit comprises a plurality of modular units (1) adapted for securement relative to one another with elongated securing means (12) through bores (10) thereof. The securing means (12) afford less frictional contact area with the modular units (1) than a securing means of same cross-section as said bores (10).

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This invention relates to a toy construction kit of the type having a plurality of small components capable of assembly into a larger structure.

It is known to have a building kit in which modular units having bores may be assembled together via connecting means, such as rods, which engage in said bores. However the connecting means may not provide a strong enough link between modular units or else if a strong link is provided it may require great force to assemble the components into structures or dismantle them again.

Also it is desirable to provide as many options to users as is possible whilst minimising the variety of components in the kit, to that end it would be advantageous if connecting means could be fitted together without any need for further securement.

According to this invention there is provided a toy construction kit comprising a plurality of modular units adapted for securement relative to one another with elongated securing means through bores thereof, the securing means affording less frictional contact area with the modular members than a securing means of same cross section as said bores.

Preferably the securing means have spaced areas of frictional contact with said bores.

Preferably said securing means are co-operable with each other to form composite securing means of greater length.

The modular units are preferably adapted for securement relative to at least one further unit in any one of three directions, these directions being defined by bores in the modular unit, which may be through-bores or blind bores. The directions are preferably orthogonally arranged with respect to each other. The directions may conveniently be along or parallel to the three major axes of a cuboid modular unit to enable a compact structural solid to be assembled.

The elongated securing means may be rods, pegs, dowels etc., and are adapted to give a friction fit in said bores. For securement of modular units provided with equally sized blind bores the securing means are conveniently sized at two standard bore lengths to enable two secured units to lie adjacent one to the other. However it is advantageous to provide securing means of greater length to enable units to be secured apart from each other, e.g. in a space-frame. Where modular units have through-bores one securing means may join any number of modular units together, the number of units depending on the length of the securing means. To ensure flexibility of use while small securing means are the most common in the building kit it is advantageous to achieve a greater length where required by fitting together co-operable parts of the securing means. The securing means are preferably rods of unit length. Conveniently the co-operable parts are at either end of each rod and could consist of a protrusion in the end of one rod co-operable with a recess in the end of another but are pref-

erably identical each comprising at least two members each with grooves or recesses which push-fit together with those of a second rod to form an interlocking joint, in this manner composite rods may be made up of two or more rods.

To allow a smooth movement of rod in bore it is advantageous to reduce friction between a rod surface and a bore interior. A preferred means to reduce friction is to minimise the contact between the rod surface and the bore interior preferably by providing discontinuous or point contact about a cross-section of the bore whilst substantially continuous contact is maintained along a length of bore to aid sliding of rod in bore. In addition any interlocking joint engaged with a bore preferably exhibits minimal contact between its contacting surfaces and bore surface.

The units and securing rods are preferably made from wood or synthetic polymeric material such as a thermoplastic material. A preferred thermoplastic material is a medium impact food approved polymer, such as acrylonitrile/butadiene/styrene. The thermoplastic material may contain an additive to improve slip characteristics if so desired. Such an additive could be a silicone-based compound.

The invention will now be further described with reference to and as illustrated in the accompanying drawings, in which:-

Figure 1 is a perspective view of a modular unit according to one embodiment of the invention with securing means fitted therein;

Figure 2 is a side elevation of the modular member of Figure 1;

Figure 3 is a side elevation of the securing means of Figure 1;

Figure 4 is a section on line AA of Figure 3;

Figure 5 is a section on line BB of Figure 3;

Figure 6 is a section showing a second securing means.

Referring to Figure 1 of the drawings a modular building unit 1 is a cuboid and has each opposite pair of faces interconnected by through-bores 6 extending between said faces. One opposite pair of faces i.e. major faces 5 has through-holes 6 arranged in three rows and two columns. Other opposite pairs of faces i.e. the end faces 7 and side faces 8 have two and one through bores respectively, located between rows and columns of the three x two array of the major faces 5. The three x two array is convenient but any m x n array would be possible where m represents a number of rows and n a number of columns. Then other pairs of opposite faces 7 and 8 would have (m-1) and (n-1) through-bores respectively.

Figure 1 shows the end faces 7 having one through-bore 9 and the side faces 8 having two through bores 10.

The modular unit 1 is made up of two components 2 and 3 which are secured together to form a structurally bonded joint 4. Each component 2 and 3 is for-

med by injection moulding a synthetic polymer material, preferably acrylonitrile/butadiene/styrene.

The through-bores 9 and 10 are formed as open channels during the moulding of components 2 and 3 and form enclosed through-bores when the components 2 and 3 are welded together. The through-bores 6 are formed during the moulding of components 2 and 3. Alternatively through-bores may be formed by drilling through a pre-formed solid member 1.

In Figure 1 securing means 12 are shown engaged in modular unit 1. The securing means 12 are pegs which are frictionally engaged within the through-bores 6, 9 and 10. The pegs 12 are push-fitted into each through-bore and have engaging surfaces 13 which abut an inner surface of the bore, said engaging surfaces 13 running preferably continuously along a length of peg 12.

The peg 12 is adapted for securement to further pegs at either end. Each peg end is provided with extending formations 16 which are capable of interlocking with identical extending formations on a second peg end.

The peg 12 comprises two identical elongate members 15 united by a web 14. The members 15 each show two narrow engaging surfaces 13 which run along their length continuously, giving four such surfaces in all. In addition to promoting ease of sliding of the peg 12 in a bore this shape also gives an advantageous reduction in material over a solid peg. A further reduction in material may be achieved by removal of material from the web 14 to leave slots 20. The interlocking formations 16 are extensions of members 15 beyond the web 14 these extensions 16 forming with the web a slot 17 whose end face 18 is preferably flat. When two pegs 12 are brought together their extensions 16 may be pushed together until the flat ends 18 abut each other, forming a stop to movement. Each extension 16 abuts at its inner face 19 the web 14 forming a friction fit.

An interlocking joint so formed is shown schematically in Figure 6. The joint also has four engaging surfaces 13 and although their area is increased interface friction between the engaging surfaces 13 and the bore is still at a relatively low level to ensure the peg and joint may pass through a bore.

characterised in that the securing means (12) have spaced areas (13) for frictional contact with said bores (10).

- 5 3. A toy construction kit as claimed in claim 1 or 2, characterised in that said securing means (12) are cooperable with each other to form composite securing means of greater length.
- 10 4. A toy construction kit as claimed in claim 1, 2 or 3, characterised in that the modular units (1) are adapted for securement relative to at least one further unit (1) in any one of three directions, which directions are defined by bores (10) of the modular unit.
- 15 5. A toy construction kit as claimed in any one of claims 1 to 4, having through-bores.
- 20 6. A toy construction kit as claimed in any one of claims 1 to 5, having blind bores.
- 25 7. A toy construction kit as claimed in claim 4, 5 or 6, characterised in that the directions are orthogonally arranged with respect to each other.
- 30 8. A toy construction kit as claimed in claim 7, characterised in that the directions are along or parallel to the three major axes of a cuboid modular unit.
- 35 9. A toy construction kit as claimed in any one of claims 1 to 8, characterised in that the securing means are rods (12) having longitudinal circumferentially spaced bore contacting surfaces (13).
- 40 10. A toy construction kit as claimed in any one of claims 3 to 9, characterised in that ends (16) of securing means (12) are adapted for mutual interengagement.
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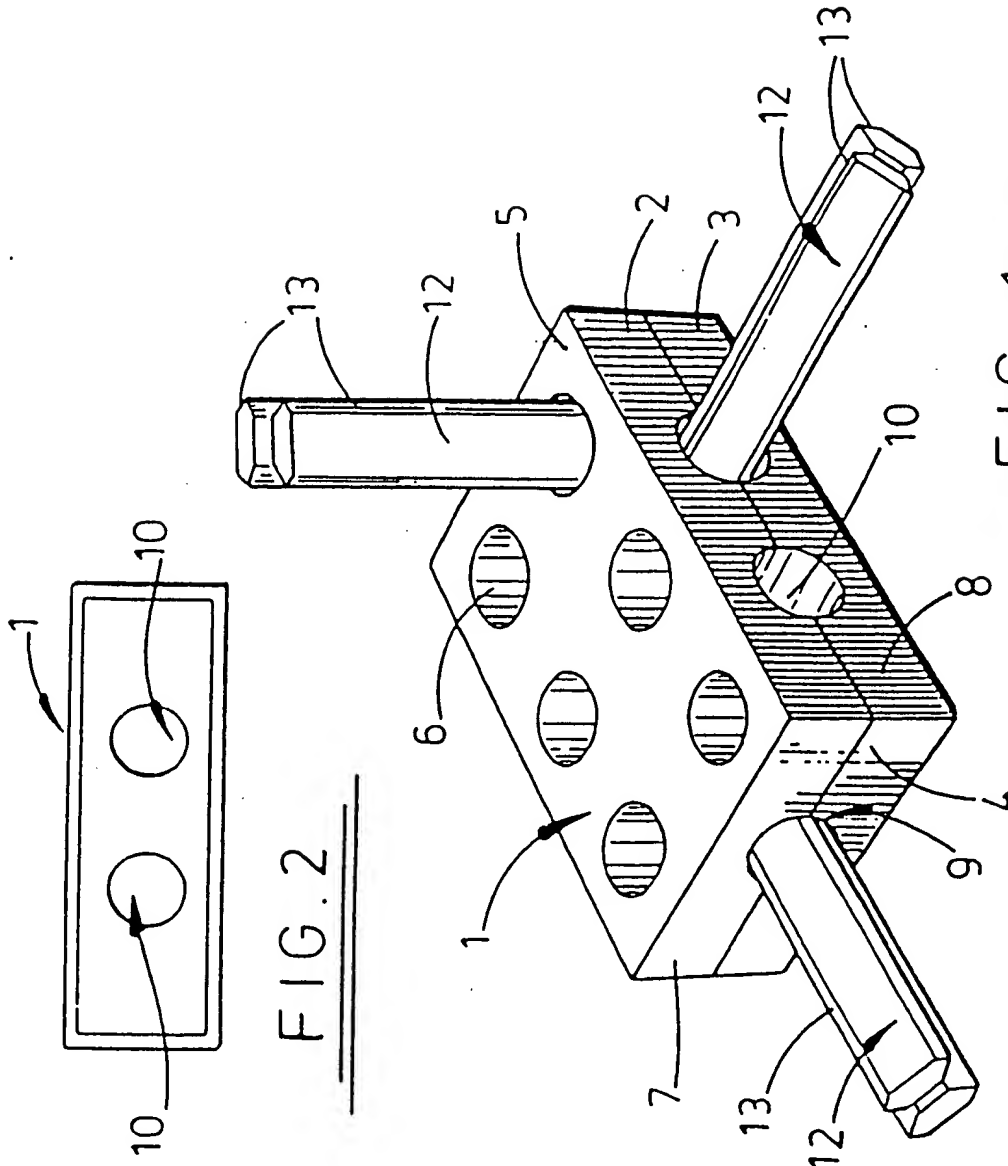
#### Claims

- 50 1. A toy construction kit comprising a plurality of modular units (1) adapted for securement relative to one another with elongated securing means (12) through bores (10) thereof, characterised in that the securing means affords less frictional contact area with the modular units than a securing means of same cross section as said bores.
- 55 2. A toy construction kit as claimed in claim 1,

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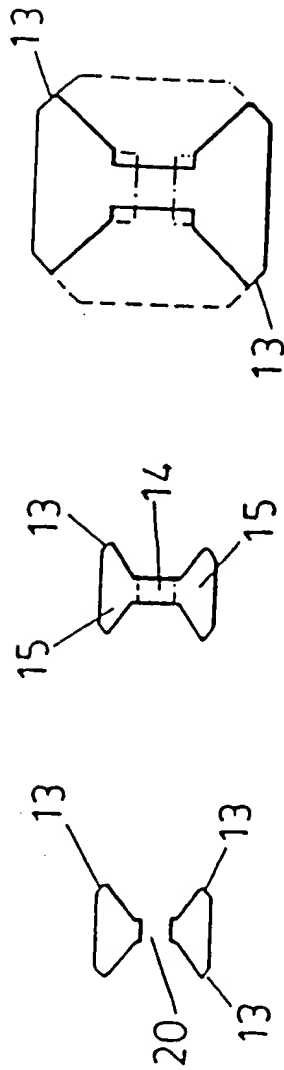


FIG. 4

FIG. 5

FIG. 6

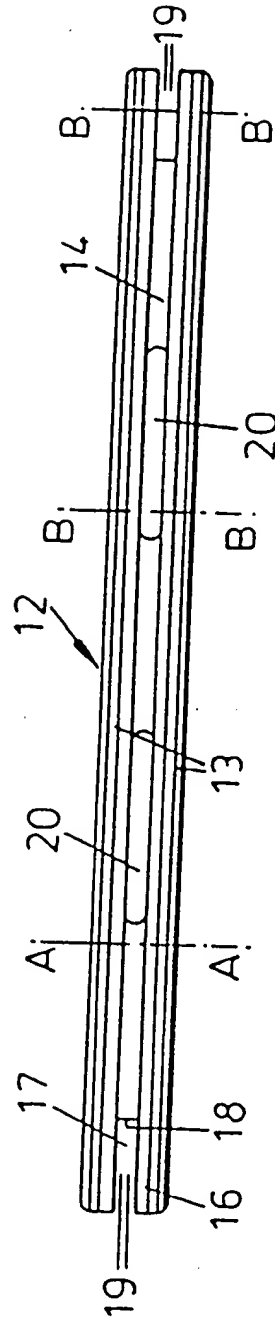


FIG. 3

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## EUROPEAN SEARCH REPORT

Application Number

EP 91308444.8

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 91308444.8
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE - A1 - 2 823 440 (SCHMIDT-TOSCHKE) • Fig. 1-3 •	1, 2, 3, 4, 5	A 63 H 33/10
A		7, 8, 10	
X	US - A - 1 142 471 (WHITE) • Fig. 1-4 •	1, 2	
A		4, 5, 7, 8, 9	
X	DE - C - 514 637 (KORBULY) • Fig. 1-6 •	1, 2	TECHNICAL FIELD <sup>2</sup> SEARCHED (Int. Cl.5)
A		5, 9	
A	GB - A - 2 108 857 (SUDLOW) • Fig. 1-3 •	1, 4, 5, 7, 8	
			A 63 H 33/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 13-11-1991	Examiner BRÄUER
CATEGORY OF CITED DOCUMENTS		I : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : technological background F : non-written disclosure P : intermediate document	
X : particularly relevant if taken alone A : particularly relevant if combined with another document of the same category A : technological background F : non-written disclosure P : intermediate document			